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Infrasound in the “zone of silence”

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Classic infrasound propagation theory describes a ‘zone of silence’ where no energy is predicted to reach sensors near the surface at ranges out to 200-250 km from the infrasound source. However, recent studies showed that under various wind and temperature conditions infrasound signals can be recorded within these distances. A better understanding of these types of signals could be helpful in characterizing the sources at these distances.

Experiments designed to understand the propagation of infrasound signals at distances of less than 200 km were conducted in central Nevada, USA during the week of 11 September 2006. A controlled suite of explosions on the surface, designed to destroy surplus military ordnance, provided the source of the infrasound signals. Three temporary 4 element infrasound arrays were deployed in a line due north of the sources at distances from 35 to 120 km. In addition, seismo-acoustic data was provided by the permanent Nevada Infrasound Array (NVIAR) and collocated seismic array NVAR, located about 30 km east of the source.

Preliminary results indicate the experiment was successful, and detections from all explosions were recorded at all arrays. Therefore the assumption of the absence of signals in the ‘zone of silence’ is incorrect. At NVIAR the shorter distance and impulsive signals indicated the arrival of direct waves. However, other signals recorded at distances of 60 to 120 km were longer in duration, and initial travel time analysis indicated the rays were turning in the stratosphere. In addition, simultaneous weather balloon recordings collected between the sources and the stations through the tropopause showed there were no conditions that would allow turning rays or reflections in the troposphere. Because the travel times were too short for turning rays above the stratosphere, we conclude that the energy was refracted in the stratosphere. Currently analysis is continuing to increase our understanding of the propagation of

these signals, and to use them in combination with seismic data to calibrate a dominant frequency/magnitude/yield relationship.